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ABSTRACT

One of a series of curriculum guides prepared for the building occupations cluster of the construction/fabrication occupational group, this guide identifies the essentials of the auto mechanics trade as recommended by successful auto mechanics. An instructional program based upon the implementation of the guide is expected to prepare a student to adequately perform entry level tasks required of an auto mechanic or to enter a post-secondary technical or apprenticeship program in auto mechanics where additional depth can be realized. Trade tasks or information are listed in chart form under the headings of accessories; basic understanding; carburetor; cooling; drive train; engine; equipment and tools; ignition; lighting and signal; wheels, suspension, brakes and steering. Space is provided on the charts to record for each item the date completed, teaching methods used, and teaching materials used. Also included are a list of teacher responsibilities, sources of occupational guidance information, recommended tests and references, and a chart depicting the total construction/fabrication occupational curriculum. A typical application for employment and a sample trade and industrial education injury report are appended. (HD)

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TRADE AND INDUSTRIAL EDUCATION

TRADE PREPARATORY TRAINING GUIDE

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
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AUTO MECHANICS

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2

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TABLE OF CONTENTS

Board Members 2

Definitions Used In This Guide 3

Occupational Analysis Chart 4

Introduction 4-5

The Auto Mechanics Guide 6

Use Of This Guide 7

Teacher Responsibilities* 8-9

Auto Mechanics Content 10-25

Appendix A 26-27

Appendix B 28-29

Recommended Texts and References 30

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DEFINITIONS USED IN THIS GUIDE

Major Occupational Group

A grouping of similar and related occupational area clusters. These groups include occupations that have been determined to be the most relevant and pertinent for inclusion in vocational education in Nebraska.

Occupational Area Clusters

These clusters are distinguishable in terms of similiar work performed, materials used, products produced, and/or services rendered. They include a wide variety of common occupational skills and knowledge.

Occupation

The career or employment engaged in by an individual for remuneration. This activity includes technical competencies and related technical information often referred to as one's vocation.

Technical Competency

The specific tasks required for a vocational trade and industrial graduate to perform successfully at the entry level in an occupational area. These technical competencies apply to the psychomotor domain and include elements which emphasize motor skills such as: operate a machine; measure; etc.

Related Technical Information

The information the entry level worker must know in order to make appropriate trade decisions which will allow him to adequately perform the tasks or technical competencies of his occupation. This information applies to the cognitive domain and includes elements which are intellectual outcomes such as: knowledge and understanding.

Related General Information

Information which is desirable and good for the tradesman to know but which is not necessary to do his work properly; information that is nice to know, such as the history and development of his trade.

Related Guidance Information

Information that helps the student choose, prepare for, secure, hold, and make progress in an occupation.

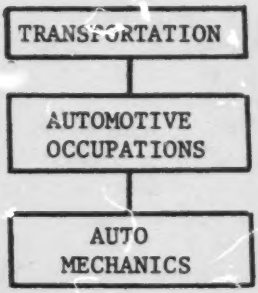
Entry Level

The technical competencies and related technical information deemed necessary by industry for obtaining and holding a job in a specific occupational area. This level of employment includes the technical competencies and related technical information that will be utilized by the employee within the first year of employment.

OCCUPATIONAL ANALYSIS CHART

The chart on this page shows Auto Mechanics as it relates to other occupations within the Transportation cluster. This guide is concerned with Auto Mechanics. Other guides have been prepared for other occupations and are available through the Nebraska State Department of Education.

OCCUPATIONAL ANALYSIS CHART
(PROJECT MODEL)



INTRODUCTION

This curriculum guide has been prepared with the help of competent craftsmen in the Auto Mechanics trades. The funds that made this guide a reality were provided through a federal research grant in cooperation with the Nebraska State Board for Vocational Education and sponsored by the Nebraska Research Coordinating Unit.

Curriculum guides have been prepared for several trade and industrial occupational clusters from which high school teachers can develop

appropriate occupational related experiences for their students. The major occupational groups, occupational area clusters, and occupations are shown in graphic form on pages of this guide.

Selection of trades within four major occupational groups have been made based on a three year survey by the Nebraska Research Coordinating Unit on needs of Nebraska business and industry. This study has identified the occupations with the greatest need for employees. A related set of curriculum guides have been prepared for these occupations.

GUIDANCE INFORMATION

The U.S. Department of Labor has developed an extremely helpful book entitled, "Occupational Outlook Handbook". This annual publication provides a very complete description of the activities of the persons employed in the occupations represented in the Nebraska trade and industrial curriculum guides. Information concerning current and future opportunities is a major portion of this publication. Inexpensive reprints in booklet form that describe individual occupations are available through the Department of Labor. These booklets should be used by trade and industrial teachers and school guidance counselors for the most up-to-date guidance information about a particular occupation.

A listing of these reprints from the "Occupational Outlook Handbook", the order numer, and price per copy is listed below for those occupations in the occupational area cluster of "Automotive Occupations".

Number	Title	Price
1700-84	Automobile Service Occupations	.20

THE AUTO MECHANICS GUIDE

This guide uses the title Auto Mechanics as the most logical descriptive term for identifying a particular related group of workers. Identification of specific job titles within this group would be determined by referring to the "Dictionary of Occupational Titles". The USOE classification system for coding instructional programs has assigned 620.131 and 620.381 to the instructional program, Auto Mechanics.

The information within this guide identifies the essentials of the auto mechanics trade as recommended by the successful auto mechanic. An instructional program based upon the implementation of this guide will prepare a student to adequately perform entry level tasks required of an auto mechanic or to enter a post-secondary technical or apprenticeship program in auto mechanics where additional depth can be realized.

The tasks and/or competencies identified within these covers are those agreed upon by a jury of reputable Nebraska auto mechanics. A separate group of persons directly employed within this trade in Nebraska have further verified these tasks and/or competencies. Jury members, tradesmen, and educators who contributed toward the development of content for this guide are listed in the front.

Course offerings in Trade and Industrial Education in Nebraska are to be organized within two period blocks of time each day, five days a week. Time is to be set aside for classroom instruction directly related to manipulative laboratory instruction. The remainder of the student's school day is to be utilized for general education subjects.

USE OF THIS GUIDE

The use of curriculum guides for trade and industrial education in Nebraska secondary schools may vary greatly, depending upon the depth and breadth of each school district's vocational program. Large school districts, for example, may utilize one particular curriculum guide to develop a course in a trade area such as auto mechanics. A small school district may, on the other hand, incorporate several curriculum guides to develop a course in the automotive occupational cluster.

The manipulative content identified in this guide is deemed necessary for inclusion in a course that is designed to prepare entry level auto mechanics. While not all secondary school facilities in Nebraska are equipped to expose students to all of this content through hands-on experience, it is assumed that this content will through some media become related technical information. This will insure inclusion of all content and provide at least discussion level understanding.

This guide is written with the assumption and expectation that the related technical information necessary to perform technical competencies will be an integral part of instruction. Thus, occupational decisions that must be made by an entry level worker will be developed along with each related manipulative activity.

The auto mechanics instructor who uses this guide is responsible for including the identified related technical information as well as the identified manipulative tasks. He is also responsible for the identification of competencies pertaining to general and guidance information, even though this information is not specifically identified for him.

Definitions for various terms used in this guide are presented in the front.

TEACHER RESPONSIBILITIES*

1. Use the American Vocational Association National Safety Council's "National Standards School Shop Safety Inspection Check List" for shop safety inspections. (Available from American Vocational Association, 1510 "H" Street, N.W., Washington, D.C. 20005)

2. Use safety check list to assure safe factors exist.

3. Require students to report ALL accidents to instructor.

4. Keep complete records of ALL accidents on file.

5. Report ALL accidents to the school administrator.

6. Develop safety consciousness in the students through teacher example--always doing things in the safe way.

7. Give shop demonstrations stressing safe use of machines.

8. Give shop demonstrations stressing safe use of hand tools.

9. Provide instruction on what to do in case of an accident.

10. Develop information sheets dealing with the safe use of specific machines.

11. Give demonstrations on the proper use and care of personal protective devices.

*These responsibilities are necessary for inclusion in all trade and industry programs in the State of Nebraska.

12. Develop information sheets dealing with the general safety rules for the trade.

13. Enclose all gears, moving belts, and other power transmission devices with permanent guards.

14. Prohibit students from operating machines when instructor is not present.

15. Prohibit the removal of guards and safety devices, even for a brief period, without the approval of the instructor.

16. Prohibit more than one operator from using a machine at one time.

17. Determine personal liability factors and liability coverage afforded through your school.

18. Provide for the bulk storage of flammable materials.

19. Mark the location of fire-fighting equipment.

20. Post instructions and inform students of building evacuation procedures.

21. Require the wearing of appropriate eye protection as specified by the State of Nebraska eye safety regulations.

22. Keep tools sharp, clean and in good working condition.

23. All shop personnel should be thoroughly familiar with the location of fire extinguishers and the type fire for which each extinguisher is designed.

AUTO MECHANIC
(Identified Trade Tasks or Information)

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIAL USED
ACCESSORIES			
Repair and adjust vibrator horn.			
Repair vacuum and electric windshield wiper.			
Repair and adjust windshield washer.			
Repair and replace speedometer cable.			
Install and repair heater and defroster.			
BASIC UNDERSTANDING			
Recognize and practice good safety habits and procedures.			

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIAL USED
Diagnose cause and effect difficulties during engine operation.			
Interpret manufacturer's shop manual specifications and procedures.			
Differentiate between and utilize the various types of lubricants and greases.			
Set-up and operation acetylene welding equipment.			
Use and maintain solder.			
Demonstrate a working knowledge of metric system.			
Apply state laws and regulations governing trade.			

Solve fundamental hydraulics and pneumatics problems.

Demonstrate a working knowledge of basic math (add, subtract, multiply, divide).

Read and interpret volt-ohm meter.

CARBURETOR

Overhaul single barrel carburetor.

Overhaul two-barrel carburetor.

Overhaul four-barrel carburetor.

Repair automatic choke.

Replace throttle lever or seal.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIAL USED
Adjust throttle linkage.			
Replace governor assembly.			
Test carburetor vacuum with gauge.			
Replace fuel filter and fuel tank filter.			
Test fuel lines and fittings.			
Install anti-pollution devices.			
COOLING			
Solder and repair radiator.			
Replace radiator and hoses.			

Winterize cooling system.

Remove and replace fan and pump assembly.

Test anti-freeze.

Replace thermostat.

DRIVE TRAIN

Identify and overhaul basic types of transmissions.

Remove and replace transmission.

Adjust front and rear bands.

Overhaul clutch.

Adjust clutch.

Adjust differential.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIAL USED
Remove and replace pinion seal of differential.			
Remove and replace drive shaft.			
Remove and replace universal joint.			
Repack universal joints.			
Remove and replace rear axle shaft.			
ENGINE			
Perform engine tune-up.			
Remove and replace engine.			
Test fuel pump.			

Remove and replace head and head gasket.

Remove, replace and adjust oil pump.

Remove and replace oil pan.

Remove and replace crankshaft.

Remove and replace connecting rod bearing inserts and main inserts.

Remove and replace camshaft.

Remove, replace, and adjust rocker arms, lifters, and tappets.

Remove and replace connecting rod.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIAL USED
Remove, replace and adjust piston rings.			
Install bearings, rings and pistons.			
Remove and replace oil seals.			
Recondition cylinders.			
Grind valves and install properly.			
Replace or repair valve guides.			
Adjust valves.			
Use oscilloscope.			
Test RPM's with tachometer.			

Remove and replace water pump.

Test cylinder compression with gauge.

Remove and replace fly-wheel.

Set timing of cam and crankshaft.

Remove and replace exhaust components.

EQUIPMENT AND TOOLS

Select correct wrenches or tools for job required.

Read a micrometer.

Read and utilize torque wrenches.

Use hydraulic lift.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIAL USED
Use plastic gauge.			
IGNITION			
Analyze battery conditions.			
Recharge battery.			
Overhaul starter.			
Perform starter torque test.			
Repair or replace starter drive.			
Test and adjust starter switches.			
Test wiring harness for circuitry.			

Replace points.

Test dwell with meter.

Adjust spark advance.

Test coil.

Test condenser.

Replace generator brushes.

True commutator.

Test and clean spark plugs.

Wire spark plugs and distributor for firing sequence.

Overhaul distributor.

Repair or replace alternator.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIAL USED
Test distributor with distributor testing machine.			
Identify current flow and reverse polarity.			
Install fuses and circuit breaker.			
LIGHTING AND SIGNAL			
Aim headlights.			
Install light relay.			
Repair and replace signal lights.			
Repair or replace lighting switch.			

Install and repair head and tail lights.

Repair and replace heat indicators.

Repair and replace gasoline gauge.

WHEELS, SUSPENSION, BRAKES AND STEERING

Recondition front end.

Remove and replace coil spring.

Remove and replace rear spring assembly.

Disassemble and assemble leaf spring.

Overhaul wheel cylinder.

TRADE TASK OR INFORMATION	DATE COMPLETED	TEACHING METHODS USED	TEACHING MATERIAL USED
Remove, replace, and repack wheel bearings.			
Overhaul master cylinder.			
Remove and replace disc brakes.			
Remove and replace Delco-Morraine brake shoes.			
Remove and replace Bendix self-adjusting rear brakes.			
Remove and replace Bendix Duo-Servo brake shoes.			
Repair and replace power brake units.			
Replace tortion bar.			

Disassemble and assemble Gemmer steering gear.

Disassemble and assemble Saginaw recirculating ball steering gear.

27

Appendix A

One of the primary objectives of trade and industrial education is the successful placement of students completing course work in a specific occupation. The following sample application form is included in this guide with the recommendation that the preparation of such forms become a necessary activity for students in all trade and industrial education courses.

APPLICATION FOR EMPLOYMENT

PERSONAL INFORMATION

DATE _____ SOCIAL SECURITY NUMBER _____

NAME _____ (LAST / FIRST / MIDDLE)

PRESENT ADDRESS _____ (STREET / CITY / STATE)

PERMANENT ADDRESS _____ (STREET / CITY / STATE)

PHONE NO. _____ OWN HOME _____ RENT _____ BOARD _____

DATE OF BIRTH _____ HEIGHT _____ WEIGHT _____ COLOR OF HAIR _____ COLOR OF EYES _____

MARRIED _____ SINGLE _____ WIDOWED _____ DIVORCED _____ SEPARATED _____

NUMBER OF CHILDREN _____ DEPENDENTS OTHER THAN WIFE OR CHILDREN _____ CITIZEN OF U.S.A. YES ○ NO ○

IF RELATED TO ANYONE IN OUR EMPLOY, STATE NAME AND DEPARTMENT _____ REFERRED BY _____

EMPLOYMENT DESIRED

POSITION _____ DATE YOU CAN START _____ SALARY DESIRED _____

ARE YOU EMPLOYED NOW? _____ IF SO MAY WE INQUIRE OF YOUR PRESENT EMPLOYER _____

EVER APPLIED TO THIS COMPANY BEFORE? _____ WHERE _____ WHEN _____

EDUCATION	NAME and LOCATION OF SCHOOL	YEARS ATTENDED	DATE GRADUATED	SUBJECTS STUDIED
GRAMMAR SCHOOL				
HIGH SCHOOL				
COLLEGE				
TRADE, BUSINESS OR CORRESPONDENCE SCHOOL				

SUBJECTS OF SPECIAL STUDY OR RESEARCH WORK _____

WHAT FOREIGN LANGUAGES DO YOU SPEAK FLUENTLY? _____ READ _____ WRITE _____

U. S. MILITARY OR NAVAL SERVICE _____ RANK _____ PRESENT MEMBERSHIP IN NATIONAL GUARD OR RESERVES _____

(CONTINUED ON OTHER SIDE)

FORMER EMPLOYERS (LIST BELOW LAST FOUR EMPLOYERS, STARTING WITH LAST ONE FIRST.)

DATE MONTH AND YEAR	NAME AND ADDRESS OF EMPLOYER	SALARY	POSITION	REASON FOR LEAVING
FROM				
TO				
FROM				
TO				
FROM				
TO				
FROM				
TO				

REFERENCES: GIVE BELOW THE NAMES OF THREE PERSONS NOT RELATED TO YOU, WHOM YOU HAVE KNOWN AT LEAST ONE YEAR.

	NAME	ADDRESS	BUSINESS	YEARS ACQUAINTED
1				
2				
3				

PHYSICAL RECORD:

LIST ANY PHYSICAL DEFECTS

WERE YOU EVER INJURED? GIVE DETAILS

HAVE YOU ANY DEFECTS IN HEARING? IN VISION? IN SPEECH?

IN CASE OF EMERGENCY NOTIFY

NAME ADDRESS PHONE NO.

I AUTHORIZE INVESTIGATION OF ALL STATEMENTS CONTAINED IN THIS APPLICATION. I UNDERSTAND THAT MISREPRESENTATION OR OMISSION OF FACTS CALLED FOR IS CAUSE FOR DISMISSAL. FURTHER, I UNDERSTAND AND AGREE THAT MY EMPLOYMENT IS FOR NO DEFINITE PERIOD AND MAY, REGARDLESS OF THE DATE OF PAYMENT OF MY WAGES AND SALARY, BE TERMINATED AT ANY TIME WITHOUT ANY PREVIOUS NOTICE.

DATE SIGNATURE

DO NOT WRITE BELOW THIS LINE

INTERVIEWED BY DATE

REMARKS:

NEATNESS		CHARACTER	
PERSONALITY		ABILITY	

HIRED FOR DEPT. POSITION WILL REPORT SALARY WAGES

APPROVED: 1. EMPLOYMENT MANAGER 2. DEPT. HEAD 3. GENERAL MANAGER

Appendix B

One of the most important parts of any trade and industrial education course is a safety program. The following form is recommended for use in courses of this type.

SAMPLE
TRADE AND INDUSTRIAL EDUCATION
INJURY REPORT* **

Student injured _____ Date _____

Shop in which accident occurred _____ Time _____

Instructor in charge _____

Nature of injury _____

_____

First aid administered _____

_____ By whom? _____

Cause of injury _____

_____

Could injury have been prevented? _____ How? _____

_____

Action taken or recommendations made to prevent recurrence _____

Remarks: _____

_____

_____

Signed _____
(Person making report)

Witnesses: _____

Names _____
and
Addresses _____

*Complete in Duplicate
**File one copy in office

FORMER EMPLOYERS (LIST BELOW LAST FOUR EMPLOYERS, STARTING WITH LAST ONE FIRST.)

DATE MONTH AND YEAR	NAME AND ADDRESS OF EMPLOYER	SALARY	POSITION	REASON FOR LEAVING
FROM				
TO				
FROM				
TO				
FROM				
TO				
FROM				
TO				

REFERENCES: GIVE BELOW THE NAMES OF THREE PERSONS NOT RELATED TO YOU, WHOM YOU HAVE KNOWN AT LEAST ONE YEAR.

	NAME	ADDRESS	BUSINESS	YEARS ACQUAINTED
1				
2				
3				

PHYSICAL RECORD:

LIST ANY PHYSICAL DEFECTS

WERE YOU EVER INJURED? GIVE DETAILS

HAVE YOU ANY DEFECTS IN HEARING? IN VISION? IN SPEECH?

IN CASE OF EMERGENCY NOTIFY

NAME ADDRESS PHONE NO.

I AUTHORIZE INVESTIGATION OF ALL STATEMENTS CONTAINED IN THIS APPLICATION. I UNDERSTAND THAT MISREPRESENTATION OR OMISSION OF FACTS CALLED FOR IS CAUSE FOR DISMISSAL. FURTHER, I UNDERSTAND AND AGREE THAT MY EMPLOYMENT IS FOR NO DEFINITE PERIOD & / OR WAY, REGARDLESS OF THE DATE OF PAYMENT OF MY WAGES AND SALARY, BE TERMINATED AT ANY TIME WITHOUT ANY PREVIOUS NOTICE.

DATE SIGNATURE

DO NOT WRITE BELOW THIS LINE

INTERVIEWED BY DATE

REMARKS:

NEATNESS		CHARACTER	
PERSONALITY		ABILITY	

HIRED FOR DEPT. POSITION WILL REPORT SALARY WAGES

APPROVED: 1. EMPLOYMENT MANAGER 2. DEPT. HEAD 3. GENERAL MANAGER

RECOMMENDED TEXTS AND REFERENCES

Auto Mechanics

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